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US005802217A

## United States Patent [19]

Suzuki et al.

[11] Patent Number: 5,802,217

[45] Date of Patent: Sep. 1, 1998

[54] IMAGE READING APPARATUS FOR OBTAINING A SHADING CORRECTION FACTOR USING TWO WHITE REFERENCE MEMBERS

[75] Inventors: Yasumichi Suzuki, Yokohama; Masanori Yamada, Kawasaki; Eiji Ohta, Fujisawa, all of Japan

[73] Assignee: Canon Kabushiki Kaisha, Tokyo, Japan

[21] Appl. No.: 541,591

[22] Filed: Oct. 10, 1995

## Related U.S. Application Data

[63] Continuation of Ser. No. 125,813, Sep. 24, 1993, abandoned.

## [30] Foreign Application Priority Data

Sep. 28, 1992 [JP] Japan 4-258207

[51] Int. Cl. <sup>6</sup> G06K 9/40; H04N 1/40

[52] U.S. Cl. 382/274; 358/461

[58] Field of Search 358/461; 382/274, 382/272, 254

## [56] References Cited

## U.S. PATENT DOCUMENTS

4,647,961	3/1987	Kammoto et al.	358/75
4,870,501	9/1989	Yoshida	358/461
4,888,492	12/1989	Aimoto	250/578
4,922,335	5/1990	Outa et al.	358/80
4,969,053	11/1990	Outa et al.	358/458

5,062,144	10/1991	Murakami	382/52
5,099,341	3/1992	Nosaki et al.	358/461
5,115,327	5/1992	Ishima	358/461
5,122,969	6/1992	Seshimoto et al.	364/571.01
5,146,351	9/1992	Maehara	358/448
5,214,520	5/1993	Miyazawa	358/461
5,282,064	1/1994	Yamada	358/487
5,371,613	12/1994	Animoto et al.	358/461

## FOREIGN PATENT DOCUMENTS

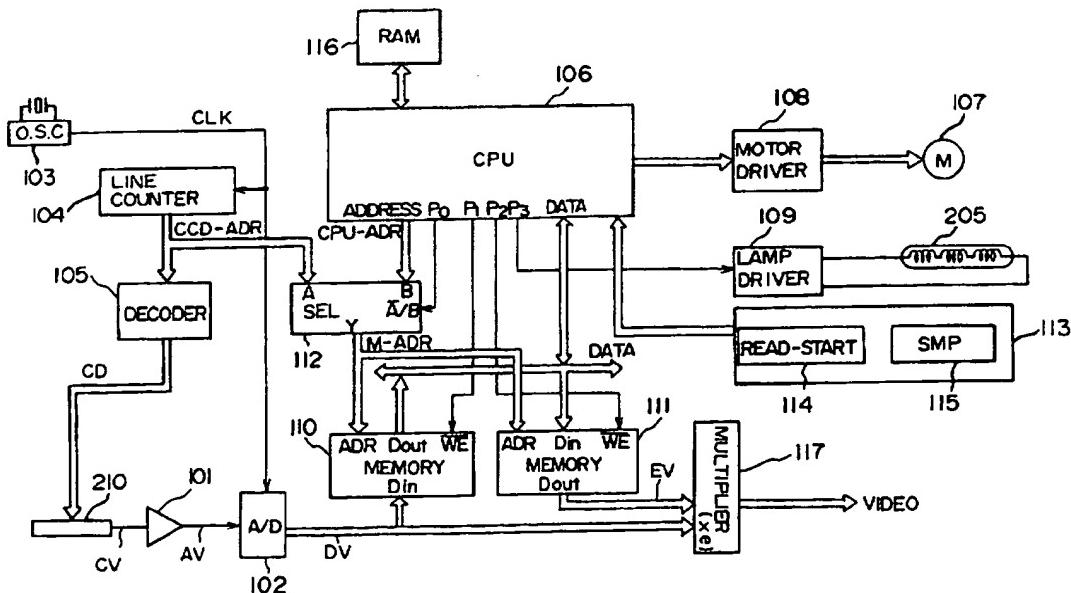
59-045755	3/1984	Japan
02297533	12/1990	Japan
2261793	5/1993	United Kingdom

Primary Examiner—Yon J. Couso  
Assistant Examiner—Ha Tran Nguyen  
Attorney, Agent, or Firm—Fitzpatrick, Cella, Harper & Scinto

## [57] ABSTRACT

An image reading apparatus comprises a reader for photoelectrically reading an image, a first reference member to be used for the measurement of irregularity of an output signal from the reader, a second reference member having density data indicating a density thereof recorded thereon, a correction unit for correcting irregularity of an image signal derived by reading an image of a document sheet by the reader based on a first reference signal derived by reading the first reference member by the reader, and a compensation unit for compensating the irregular correction operation by the correction unit based on a second reference signal derived by reading the second reference member by the reader and the density of the second reference member derived by reading the density data.

9 Claims, 6 Drawing Sheets





US005317421A

**United States Patent [19]**

Ito

[11] Patent Number: **5,317,421**  
 [45] Date of Patent: **May 31, 1994**

**[54] WHITE REFERENCE DATA GENERATING UNIT APPLIED TO SHADING CORRECTION SYSTEM****[75] Inventor:** Masaaki Ito, Yokohama, Japan**[73] Assignee:** Ricoh Company, Ltd., Tokyo, Japan**[21] Appl. No.:** 816,671**[22] Filed:** Jan. 3, 1992**[30] Foreign Application Priority Data**

Jan. 8, 1991 [JP]	Japan .....	3-011522
Jan. 8, 1991 [JP]	Japan .....	3-011551
Sep. 30, 1991 [JP]	Japan .....	3-276291

**[51] Int. Cl. 5** ..... H04N 1/04**[52] U.S. Cl.** ..... 358/464; 358/461;  
358/462**[58] Field of Search** ..... 358/448, 461, 462, 464,  
358/465, 163; 382/52, 53; H04N 1/38, 1/40**[56] References Cited****U.S. PATENT DOCUMENTS**

4,783,836 11/1988	Takashima .....	358/163
5,062,144 10/1991	Murskami .....	358/464
5,099,341 3/1992	Nosaki et al. ....	358/461
5,146,351 9/1992	Machara .....	358/461

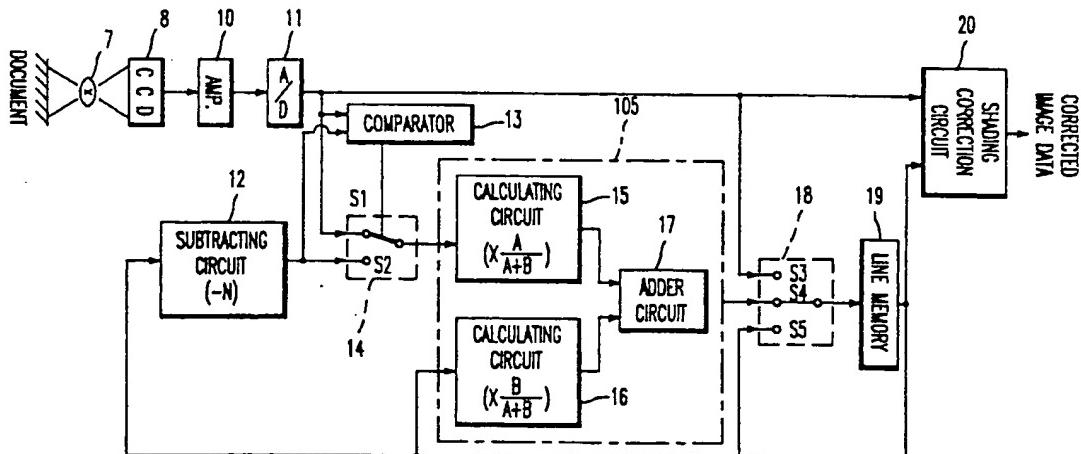
**FOREIGN PATENT DOCUMENTS**

62-189871 8/1987 Japan .

2111165 4/1990 Japan .

*Primary Examiner—Edward L. Coles, Sr.**Assistant Examiner—Kim Yen Vu**Attorney, Agent, or Firm—Oblon, Spivak, McClelland, Maier & Neustadt***[57] ABSTRACT**

A white reference data generating unit which generates white reference data used in a shading correction process includes a line memory for storing white reference data, a determination circuit for determining whether or not the image data supplied from an image sensor is equal to or less than a predetermined threshold level, a updating circuit for updating the white reference data stored in the line memory to new white reference data calculated based on the white reference data stored in the line memory and input data while each line on a white reference plate is scanned, and a selector for supplying the image data, as the input data, to the updating circuit when the determination circuit determines that the image data is greater than the threshold level, and for supplying difference data, as the input data, to the updating circuit when the determination circuit determines that the image data is equal to or less than the threshold level, the difference data being obtained by subtracting a predetermined value from the white reference data stored in the line memory.

**19 Claims, 4 Drawing Sheets**



US005146351A

## United States Patent [19]

Maehara

[11] Patent Number: 5,146,351

[45] Date of Patent: Sep. 8, 1992

## [54] IMAGE READER

[75] Inventor: Yoshiaki Maehara, Fukuoka, Japan

[73] Assignee: Matsushita Electric Industrial Co., Ltd., Kadoma, Japan

[21] Appl. No.: 750,736

[22] Filed: Aug. 21, 1991

## Related U.S. Application Data

[63] Continuation of Ser. No. 593,326, Oct. 2, 1990, abandoned, which is a continuation of Ser. No. 396,079, Aug. 21, 1989, abandoned.

## [30] Foreign Application Priority Data

Aug. 22, 1988 [JP] Japan ..... 63-207650

[51] Int. Cl.<sup>5</sup> ..... H04N 1/40  
 [52] U.S. Cl. ..... 358/448; 358/461  
 [58] Field of Search ..... 358/406, 446, 447, 452, 358/456, 462, 467, 471, 473, 474, 475, 483, 455, 458, 461, 463, 465, 448; 382/50, 53, 54

## [56] References Cited

## U.S. PATENT DOCUMENTS

3,874,799	4/1975	Isaacs et al.	.....	356/236
4,040,094	8/1977	Everett et al.	.....	358/459
4,174,528	11/1979	White	.....	358/213.19
4,660,082	4/1987	Tomohisa et al.	.....	358/406
4,916,549	4/1990	Sekizawa	.....	358/461

Primary Examiner—Edward L. Coles, Sr.

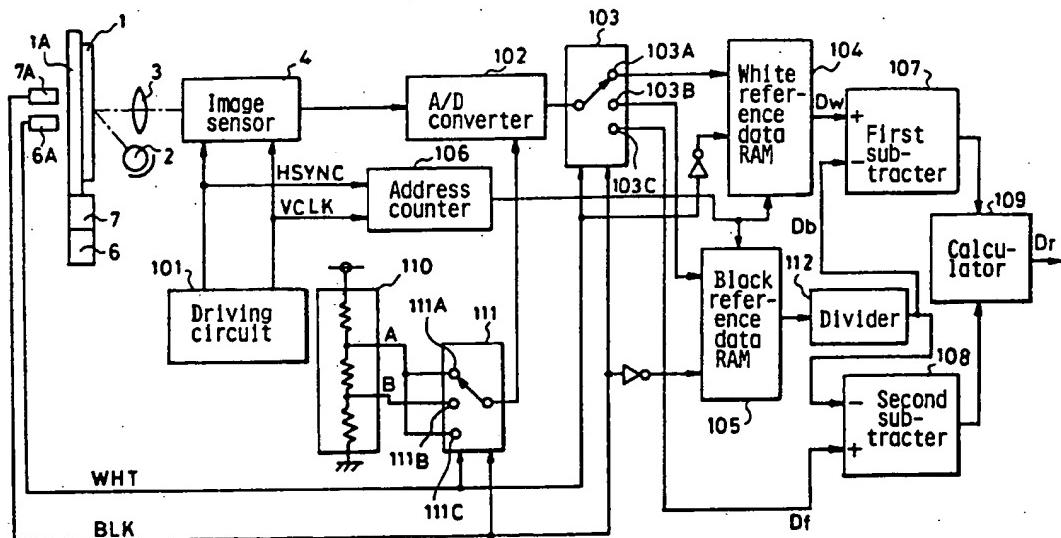
Assistant Examiner—Jerome Grant, II

Attorney, Agent, or Firm—Cushman, Darby &amp; Cushman

## [57] ABSTRACT

An image signals of a black reference plate, a white reference plate and a manuscript detected by an image sensor are converted into digital data by an A/D converter, and in the A/D conversion, the image signal of the black reference plate which is enhanced in level is applied to the A/D converter, and then the enhanced digital data for the black reference plate is returned to an original level, and a corrected image data which is represented by a difference of the image data of the manuscript and the image data of the black reference plate is issued.

4 Claims, 10 Drawing Sheets





US006522432B1

**(12) United States Patent**  
**Lin**

**(10) Patent No.:** US 6,522,432 B1  
**(45) Date of Patent:** Feb. 18, 2003

**(54) IMAGE SCANNER WITH AUTOMATIC SIGNAL COMPENSATION**

5,278,674 A \* 1/1994 Webb et al. .... 358/475  
5,296,944 A \* 3/1994 Suzuki et al. .... 358/475  
5,587,746 A \* 12/1996 Nakakuki .... 348/708

**(75) Inventor:** Chien-Chih Lin, Hsien (TW)

\* cited by examiner

**(73) Assignee:** Primax Electronics Ltd., Taipei (TW)

**Primary Examiner—**Mark Wallerson  
**(74) Attorney, Agent, or Firm—**Winston Hsu

**(\*) Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1049 days.

**(57) ABSTRACT**

The present invention relates to an image scanner with automatic signal compensation function for compensating the instability of a light source of the image scanner. The image scanner comprises a test region, a light source for illuminating the document and the test region, optical means for conveying the light reflected from the document and the test region, a line image sensor for receiving the light from the optical means and generating an image signal corresponding to the light reflected from the document and a brightness signal corresponding to the light reflected from the test region, and a signal compensation circuit for amplifying the image signal according to the brightness signal to compensate the instability in the brightness of the light source.

9 Claims, 3 Drawing Sheets

**(56) References Cited**

**U.S. PATENT DOCUMENTS**

5,151,796 A *	9/1992 Ito et al.	358/475
5,212,376 A *	5/1993 Liang	358/484
5,249,068 A *	9/1993 Takase	358/475

120~

CALCULATE BRIGHTNESS Y1 FOR EACH (R.G.B.) SIGNAL OF THE BRIGHTNESS SIGNAL

{ 121

CALCULATE BRIGHTNESS AVERAGE Y2 OF THE BRIGHTNESS SIGNAL

{ 122

MODIFY EACH (R.G.B.) SIGNAL OF THE IMAGE SIGNAL: (R\*Yc/Y2, G\*Yc/Y2, B\*Yc/Y2)

{ 123



US005726771A

# United States Patent [19]

Gann et al.

[11] Patent Number: 5,726,771

[45] Date of Patent: Mar. 10, 1998

[54] SYSTEM AND METHOD FOR OPTIMIZING TONAL RESOLUTION IN AN OPTICAL SCANNER

[75] Inventors: Robert G. Gann, Bellvue; Robert E. Sobol, Ft. Collins, both of Colo.

[73] Assignee: Hewlett-Packard Company, Palo Alto, Calif.

[21] Appl. No.: 332,210

[22] Filed: Oct. 31, 1994

[51] Int. CL<sup>6</sup> H04N 1/40

[52] U.S. Cl. 358/445; 358/446; 382/270; 382/273

[58] Field of Search 358/483, 482, 358/446, 445, 406, 447, 461, 463, 504, 475, 509, 512, 479, 520; 348/229, 255, 222, 300, 297; 382/273, 270

## [56] References Cited

### U.S. PATENT DOCUMENTS

4,329,717	5/1982	Logie et al.	358/446
4,660,082	4/1987	Tomohisa et al.	358/446
4,876,605	10/1989	Ishikawa et al.	382/273
4,912,558	3/1990	Easterly et al.	358/446
5,067,168	11/1991	Nagano	382/273
5,084,772	1/1992	Shimoyama	358/475
5,224,178	6/1993	Madden et al.	358/466
5,228,099	7/1993	Yamada	382/273
5,249,068	9/1993	Takase	358/475
5,267,053	11/1993	Poturek et al.	358/446
5,278,674	1/1994	Webb et al.	358/475
5,282,063	1/1994	Deacon et al.	358/479

5,285,293	2/1994	Webb et al.	358/406
5,291,307	3/1994	Luckhurst	382/273
5,295,204	3/1994	Parulski	358/479
5,296,944	3/1994	Suzuki et al.	358/446
5,321,528	6/1994	Nakamura	358/482
5,331,435	7/1994	Scott	358/479
5,343,308	8/1994	Johnston	358/445
5,361,140	11/1994	Hayenga et al.	358/446
5,363,318	11/1994	McCauley	358/512
5,381,245	1/1995	Johnston	358/487
5,408,335	4/1995	Takahashi et al.	358/446
5,442,464	8/1995	Ito	358/482
5,555,106	9/1996	Hsu	358/512

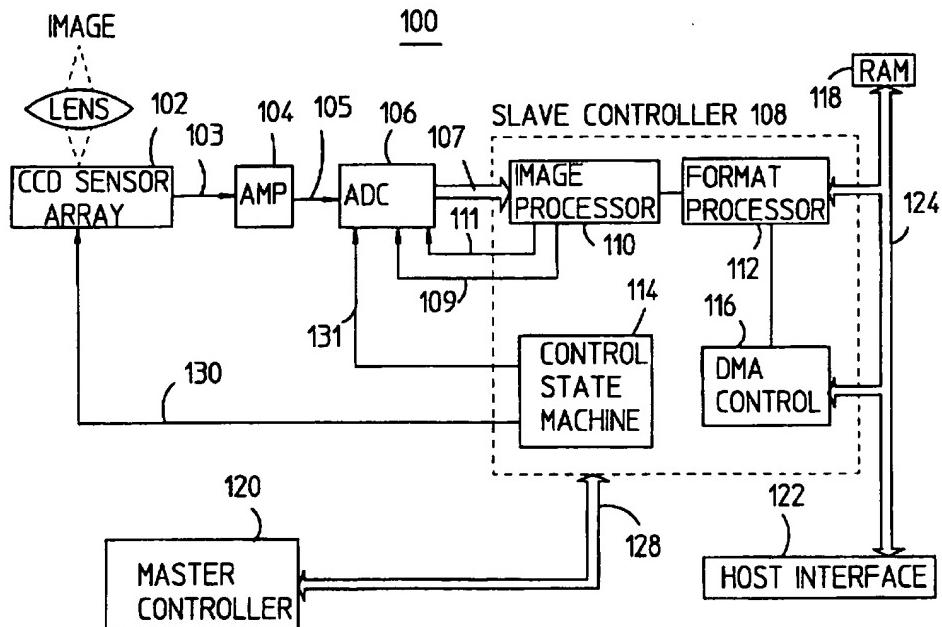
Primary Examiner—Edward L. Coles, Sr.

Assistant Examiner—Fan Lee

## [57] ABSTRACT

The tonal resolution of an image scanner is improved by adjusting the dynamic range of an analog-to-digital converter of the scanner. A preview scan of the image is made. The image data from the preview scan is then analyzed to determine a maximum intensity and a minimum intensity. The value of the maximum intensity is used to set a white intercept of the image scanner such that a maximum digital value of the analog-to-digital converter corresponds to the maximum intensity present in the image data from the preview scan. The minimum intensity is used to set a black intercept of the image scanner such that the minimum intensity in the image data from the preview scan corresponds to the minimum digital number output by the analog-to-digital converter. Tonal resolution of the image scanner is optimized then by performing a final scan of the image with the analog-to-digital converter programmed to reflect the new white intercept and black intercept values.

15 Claims, 3 Drawing Sheets





US005249068A

**United States Patent [19]**  
**Takase**

[11] Patent Number: **5,249,068**  
[45] Date of Patent: **Sep. 28, 1993**

## [54] IMAGE READING APPARATUS

[75] Inventor: Osamu Takase, Yokohama, Japan  
[73] Assignee: Ricoh Company, Ltd., Tokyo, Japan  
[21] Appl. No.: 631,912

[22] Filed: Dec. 21, 1990

## [30] Foreign Application Priority Data

Dec. 25, 1989 [JP] Japan ..... 1-335277

[51] Int. Cl. 5 ..... H04N 1/40  
[52] U.S. Cl. ..... 358/461; 358/464;  
358/471; 358/475  
[58] Field of Search ..... 358/461, 464, 471, 445,  
358/446, 463, 465, 496, 475

## [56] References Cited

## U.S. PATENT DOCUMENTS

4,660,082	4/1987	Tomohisa et al.	358/406
4,829,379	5/1989	Takaki	358/461
4,868,685	9/1989	Ueno	358/461
4,870,501	9/1989	Yoshida	358/461
4,916,549	4/1990	Sekizawa	358/461
4,989,100	1/1991	Ishima	358/461
5,062,144	10/1991	Murakami	358/461
5,070,414	12/1991	Tsutsumi	358/461
5,099,341	3/1992	Nosaki et al.	358/461
5,101,281	3/1992	Ishima	358/461
5,105,286	4/1992	Sakurai	358/461
5,146,351	9/1992	Maehara	358/461
5,157,518	10/1992	Ohtaki et al.	358/461

Primary Examiner—Edward L. Coles, Sr.

Assistant Examiner—Fan Lee

Attorney, Agent, or Firm—Oblon, Spivak, McClelland,  
Maier & Neustadt

## [57] ABSTRACT

An image reading apparatus having a line sensor for supplying an image signal in accordance with a brightness of a specified region of an original document along a main scan line, the line sensor having a plurality of photoelectric conversion elements aligned along a main scan line. The image reading apparatus comprises a sampling part for sampling and holding a level of a reference signal initially outputted by the line sensor when a reference board is scanned, a correction part for calculating a correction quantity according to a level of a signal outputted by the photoelectric conversion elements when the specified region of the original document is scanned, a subtraction part for subtracting the correction quantity from the level of the reference signal when the reference board is scanned, to supply a corrected reference signal according to the brightness of the specified region of the original document, and a normalization part for normalizing a level of an image signal outputted by the photoelectric conversion elements when the original document is scanned, based on a level of the corrected reference signal from the subtraction part.

9 Claims, 4 Drawing Sheets

